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LEE, PING				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/812,066

**Applicant(s)**

WALKER, MICHAEL

**Examiner**

Ping Lee

**Art Unit**

2614

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 August 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. Claims 13 and 14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 12 and 16-18 introduce new matter because claim 12 has been amended to have a computer readable recording medium having recorded thereon a program for executing a method of claim 1. The specification as originally filed fails to disclose such limitation.

Claims 13 and 14 introduce new matter because claim 1 has been amended to specify "first virtual microphone signal corresponds to a direct sound without any time delay". The specification as originally filed defines that only one virtual microphone signal is being treated as a direct sound without any delay. See Fig. 1, S1 is the only direct sound without the delay. See Fig. 2, S1\* represented the only direct sound without any delay. Since claim 1 already defines the direct sound as the first virtual microphone sound, the last virtual sound specified in claim 13 cannot be a direct sound. Claim 15 has a similar defect with respect to claim 11. Claim 17 has a similar defect with respect to claim 1.

Claims 16 and 18 specify "the first virtual microphone is delayed by a time elapsed between an onset of the direct sound in the acoustic signal and an onset of a last reverberation sound". The limitation conflicts with the limitation in claim 1 which defines that "first virtual microphone signal corresponds to a direct sound without any time delay".

Therefore, claims 12-18 introduce new matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

***Claim Rejections - 35 USC § 102***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1-5, 8 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Tazawa et al (hereafter Tazawa) ("A Fully Passive Echo-Canceler using a Single Microphone).

Regarding claims 1 and 11, Tazawa discloses a method and a device for enhancing the quality of a received acoustic signal, wherein the acoustic signal has been generated by a single microphone (p. 1191, "Basic Idea"), wherein acoustic signal is subjected to an analysis of characteristics, the method comprising:

estimating a plurality of virtual microphone signals ( $A_1s(t-t_1)$ ,  $A_2s(t-t_2)$ ) and so on; see equation 1) using the analysis, from the acoustic signal ( $m(t)$ ) wherein the plurality

of virtual microphone signals are free of reverberation( the terms  $A_1s(t-\tau_1)$  and  $A_2s(t-\tau_2)$  represent the direct sound at the time  $\tau_1$  and  $\tau_2$  respectively; the terms  $A_1s(t-\tau_1)$  and  $A_2s(t-\tau_2)$  themselves do not include reverberation) and the first virtual microphone signal corresponds to a direct sound without any time delay ( $s(t)$ ), and

wherein an n-th virtual microphone signal is obtained using a time delay  $\tau_n$  ( $\tau_1$  or  $\tau_2$  depending on whether it is for the first or second term after the direct sound) that is a time period between an onset of an (n-1)-th reverberation sound of the acoustic signal and an onset of an n-th reverberation sound of the acoustic signal (p. 1191, under "Basic Idea", the term has been defined under equation 1), the n being an integer equal or greater than 2;

delaying each of the plurality of virtual microphone signals ( $A_1s(t)$ ,  $A_2s(t)$ ) by a different respective period of time ( $\tau_1$ ,  $\tau_2$ ); and

adding the delayed each of the plurality of virtual microphone signals to produce an output signal (by the summation).

Regarding claim 2, as shown in Fig. 1, at time  $\tau_1$ , the onset of a first reverberation sound occurred, the term in the equation shows the delay ( $\tau$ ) and the modification parameter (coefficient  $A_i$ ). The acoustic signal is subtracted by the modified delay signal (equation 7), and the first virtual microphone signal is subjected to an analysis to generate one or several analysis parameters (step 2 and p. 1193), and the modification parameters are adapted within a feedback loop to optimize the first virtual microphone signal by minimizing overall amplitude of the first virtual microphone signal (see the comparison between Fig. 6 and Fig. 8).

Regarding claim 3, the claimed amplifying reads on A1.

Regarding claim 4, Tazawa shows that more than one echo is being canceled, and two separate delays are used to simulation in the experiment disclosed on p. 1193.

Regarding claim 5, Tazawa shows the step of summation (see equation 6 for example), the undelayed virtual microphone signal is the direct sound.

Regarding claim 8, Tazawa shows the Fourier transform and the frequency domain.

***Claim Rejections - 35 USC § 103***

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
5. Claims 6, 7 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tazawa.

Regarding claim 6, Tazawa fails to show a FIR unit. However, based on Tazawa's teaching, the enhanced audio signal is generated by calculating steps involving delay, multiplication and summation. One skilled in the art would have recognized that such calculation could be performed by a FIR filter. Examiner takes Official Notice that this feature is notoriously well known in the art. Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa by implementing the calculation using well known FIR filter in order to obtain the enhanced audio signal.

Regarding claim 7, Tazawa fails to show a least mean square method and/or a normalized least mean square method. However, based on Tazawa's teaching, one

has to minimize the difference between estimate amplitude  $A'$  and the actual amplitude  $A$  in order to find a solution that is closely resemble the original signal. One skilled in the art would have recognized that such calculation could be performed by a least mean square method and/or a normalized least mean square method. Examiner takes Official Notice that this feature is notoriously well known in the art. Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa by utilizing a least mean square method and/or a normalized least mean square method in order to obtain the best amplitude  $A'$  for calculating the enhanced audio signal.

Regarding claim 12, Tazawa fails to explicitly show a computer readable recording medium. However, Tazawa teaches a simulation performed using a male voice. The data analysis is performed and the graphs are shown. The analysis involves the cepstrum which is best performed using a computer with instruction stored in a computer readable recording medium. Therefore, it would have been obvious to one of ordinary skill in the art to modify Tazawa by using a computer to perform the simulation in order to determine how effective the echo and/or reverberation being canceled.

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tazawa in view of Dear et al (hereafter Dear) (US 4,832,147).

Regarding claim 9, Tazawa teaches how to measure the time delay in Fig. 1 by observing the edge of the signal amplitude following a timer period of substantially constant signal amplitude. However, Tazawa fails to explicitly show the limited frequency interval. Tazawa teaches that echo and/or reverberation in a stadium would

make it difficult to distinguish speech (see "INTRODUCTION"). Dear teaches that, without echo cancellation, the intelligibility of an audio signal at 100Hz inside a gymnasium is unacceptable (col. 3, lines 37-48). Thus, it would have been obvious to one of ordinary skill in the art to modify Tazawa in view of Dear to measure the time delay at 100 Hz in order to design the echo cancellation for reducing the echo in a gymnasium or other similar enclosure.

### ***Election/Restrictions***

7. Applicant is being reminded that an election without traverse of species II, Fig. 5 was filed on 10/23/07.

### ***Response to Arguments***

8. Applicant's arguments filed 4/22/08 have been fully considered but they are not persuasive.

Applicant argued that Tazawa fails to show that the two echo signals are free of any reverberation as the plurality of virtual signals of the claim. This allegation is not supportive. As shown in Fig. 1, the detected microphone signal is a combination of a direct sound and two echoes. The first echo would be  $A1s(t-t_1)$  and the second echo would be  $A2s(t-t_2)$ . One skilled in the art would have recognized that each echo term is related to the direct signal with a factor  $A1$  or  $A2$ , and it does not include any additional reverberation. Each echo reads on the claimed one of microphone virtual signal. No where in the whole article that Tazawa indicates that each echo term includes any



additional reverberation. If applicant does not agree, applicant should point out the exact text in Tazawa for support. One can also see the similarity between equation 2 of the instant application with equation 2 of Tazawa. The present invention as disclosed in the specification using subtraction to subtract the reverberation from an acoustic signal just as Tazawa does. So the argument presented on the upper section of p. 10 is not valid.

### ***Conclusion***

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ping Lee whose telephone number is 571-272-7522.

The examiner can normally be reached on Monday, Wednesday and Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian C. Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ping Lee/  
Primary Examiner, Art Unit 2614

pwl